WWC EVIDENCE REVIEW PROTOCOL FOR EARLY CHILDHOOD EDUCATION INTERVENTIONS

Topic Area Focus

The What Works Clearinghouse (WWC) review in this topic area focuses on early childhood education (ECE) interventions (curricula and practices, as defined below) designed for use in center-based settings with three- to five-year-old children who are not yet in kindergarten or children who are in preschool, with a primary focus on cognitive and language competencies associated with school readiness (language, literacy, math, and cognition). Interventions and studies with a primary focus on socio-emotional development and approaches to learning may be addressed in a subsequent phase of the review.

The review includes a focus on center-based early childhood education interventions designed to improve the school readiness skills of preschool children with developmental delays or diagnosed disabilities. These may be inclusive interventions used with all children or targeted interventions designed specifically for children with developmental delays or diagnosed disabilities.

A systematic review of evidence in this topic area addresses the following questions:

- Which early childhood education interventions improve preschool children's cognitive and language competences associated with school readiness (cognition, language, literacy, and math skills)?
- Which early childhood education interventions improve cognitive and language competencies associated with school readiness among children with developmental delays or diagnosed disabilities?
- Does the effectiveness of early childhood education interventions differ by type of outcome?
- What types of early childhood education interventions are particularly effective for which children?

Key Definitions

Early Childhood Education Intervention. The WWC ECE review examines evidence of the effectiveness of center-based early childhood education interventions (curricula and practices) designed to improve children's school readiness, focusing on those interventions that have as their primary goal improving preschool children's cognitive and language competencies.

- ***Curriculum:*** A curriculum is a set of activities, materials, and/or guidance for working with children in classrooms that has a clearly identified name, includes a thorough write-up/description, and can be replicated by others based on written guidance, staff training,

or technical assistance. Some ECE curricula are comprehensive, and some ECE curricula are supplemental.

- ***Practice:*** A practice is a named approach to promoting children's development that staff implements in interacting with children and materials in their classroom. The named approach must be clearly described and commonly understood in the field and literature.

Programs defined by funding streams or service delivery models are not considered interventions for this review. For example, Head Start programs and state-supported pre-kindergarten programs are not considered interventions, although specific curricula or practices used by these programs may be eligible for the review.

ECE policies that influence the conditions under which curricula and practices are implemented are not considered interventions for the review at this time. For instance, mandates concerning teacher qualifications or student:teacher ratios are not considered interventions; however, to the extent possible, the impact of these policies on the impact of an intervention are reviewed.

Short-term learning trials, which are relatively brief studies of systematic variations in parameters of how children are exposed to materials or assessed, are not considered interventions for the review at this time. Short-term learning trials often involve systematic manipulation of stimulus presentation, feedback type, or material content. Outcomes are generally measured immediately following the manipulation, which may last one or only a few sessions, often in a within-subjects experimental design.

Variations in implementation characteristics of early childhood education programs. The different forms of early childhood interventions are distinguished along with any associated differences in their outcomes. Within the category of curricula, the review distinguishes those that are comprehensive and those that are supplemental.

- ***Comprehensive curriculum:*** A comprehensive curriculum is a curriculum that is intended to be the primary instructional tool used to guide high quality instruction in pre-kindergarten classrooms and designed to meet children's learning needs in multiple areas. It provides activities, materials, and guidance for an entire preschool day (at least 3-1/2 hours). A comprehensive curriculum generally includes a scope and sequence.

- ***Supplemental curriculum:*** A supplemental curriculum is a curriculum that is intended for flexible use as part of differentiated instruction or as an intervention that meets children's learning needs in specific areas (phonological awareness, oral language, literacy, math, etc.). Supplemental curricula are not intended to provide activities, materials, and guidance for an entire preschool day (supplemental curricula are used for about 20 - 60 minutes).

Within the category of practices, the review distinguishes general and targeted practices.

- ***General Practice:*** A general practice is a named approach to promoting children's development that the program staff implements in interacting with children and materials in their classroom. The named approach must be clearly described and commonly understood in the field and literature.

- ***Targeted Practice:*** A targeted practice is a named approach to promoting the development of children with specific developmental delays or diagnosed disabilities that the program staff implements in interacting with these children and materials in their classroom. The named approach must be clearly described and commonly understood in the field and literature.

School Readiness. Within the field of early childhood education, children's school readiness is typically understood to encompass:

- Cognitive and language competencies associated with school readiness (language, literacy, math, cognition)

- Socio-emotional development and approaches to learning (social relationships, self-concept, self-control, cooperation, reasoning and problem solving, engagement and persistence, initiative and curiosity)

- Physical well-being and motor development (e.g., physical health, gross and fine motor skills)

Preschool curricula and practices may have a focus on cognitive and language competencies, socio-emotional development, or both. Preschool curricula also may address explicitly the issues of physical health and motor development. The initial focus of this review is on curricula and practices that have cognitive and language competencies as their primary focus. A subsequent focus of the review may be on curricula and practices that have socio-emotional development as their primary focus. Curricula and practices with a dual focus (i.e., both cognitive and language competencies and socio-emotional development as determined by a scope and sequence or other explicit statement of focus) are reviewed with other interventions that have a focus on cognitive and language development if the primary content of the materials focuses on cognitive and language outcomes. Similarly, dual-focus curricula and practices are reviewed with other interventions that have a primary focus on socio-emotional development if the primary content of the materials focuses on socio-emotional outcomes. Curricula or practices that have a primary focus on physical health and motor development, although important, are not included in this review.

Preschoolers. Preschoolers are three- to five-year-old children who have not yet entered kindergarten or children who are in preschool.

Preschoolers with Disabilities. Preschoolers with disabilities are three- to five-year-old children who have not yet entered kindergarten or children who are in preschool who are eligible for special education and related services under Part B of the Individuals with Disabilities Education Act (IDEA). Eligible children are those with diagnosed disabilities and developmental delays who need special education and related services.

GENERAL INCLUSION CRITERIA

Populations to be Included

The early childhood education review includes interventions for three- to five-year-old children who are not yet in kindergarten and who are attending center-based preschool programs. The children must attend a center-based preschool or child-care program in the U.S. or its territories or tribal entities, or in a country that is sufficiently similar to the U.S. that the study could be replicated in the U.S. (e.g., English is the societal language). To be included, the children must speak English or be non-native speakers of English who are English Language Learners.

Subpopulations of interest include children in different age groups (3- to 4-years and 4- to 5-years), English Language Learners, children from different racial/ethnic groups, children from lower socioeconomic status (SES) families, and children with developmental delays or diagnosed disabilities.

Types of Interventions to be Included

The interventions to be included are determined after an exhaustive search of the published and unpublished literature by the ECE Evidence Report Team as well as a review of the nominations submitted to the WWC. The intervention should have enhancing cognitive and language competencies associated with school readiness as a primary goal, but it may have other goals. It does not necessarily have to be referred to as a school readiness program. All reviewed curricula and practices must be able to be disseminated (i.e., can be implemented by those other than the developers of the approach). To allow attribution of effects to practices, which may vary to some extent from implementation to implementation, the ECE team prioritizes practices for which there are at least two studies that meet WWC evidence standards, either with or without reservations.

Two broad types of interventions to be included are:

1. ***Curricula.*** Examples of early childhood education curricula include:

    - A comprehensive curriculum that fosters cognitive, language, social, physical, and emotional development of three- and four-year-old children through a daily structure of thematic activities

    - A supplemental curriculum that features systematic, focused instruction in oral language, phonological and alphabetical awareness, and early reading concepts for three- and four-year-old children and includes a teacher's guide and materials needed for the instruction

    - A comprehensive curriculum that consists of a set of guiding principles and practices that adults follow as they work with and care for three- and four-year-old children. These principles are intended as an "open framework" that teams of adults are free to adapt to the special needs and conditions of their group, their setting, and their community.

2. ***Practices.*** Examples of early childhood education practices include:

    - Dialogic reading, a general practice that increases stimulation of children's language skills through interactive picture-book reading

    - Time delay, a technique to increase language and facilitate generalization in children with mental retardation

Types of Research Studies to be Included

This review includes empirical studies published in English dated 1985 or later that focus on the effect of center-based early childhood education interventions on children's school readiness outcomes.[1] The studies include children attending preschools and child-care centers in the U.S. or its territories or tribal entities, or in a similar country. The focus of the outcome measures needs to be the children, not the teachers, and at least one of the outcome measures needs to focus on a cognitive or language competency associated with school readiness and demonstrate sufficient reliability or face validity.

The review focuses on well-conducted randomized controlled trials (RCTs) and well-controlled quasi-experimental designs (QEDs), including matched groups and regression discontinuity design (RDD) evaluations. This focus is reflected in the collection, review, and reporting of the research. At this time, the WWC has not developed standards for reviewing or reporting on single-case design studies. Consequently, studies with a single-case design are not currently included in this review.

The WWC ECE review includes some studies that compare an intervention to a no-treatment or business as usual comparison group (e.g., typical preschool curriculum) and some studies that compare two variations of the same intervention (e.g., shared reading with a picture/vocabulary focus versus shared reading with a print/alphabet knowledge focus). In the latter case, the study does not allow the isolation of the effect of the particular intervention (e.g., the impact of shared reading). However, in all cases where a contrast of this type provides useful information it will be included in the intervention report because we believe that practitioners may find information about variations of an intervention useful to their classroom practices. In these cases, the study will be excluded from the overall rating of effectiveness and improvement indices, but the study findings will be described in the body of the report and the findings will be included in the technical appendices.

In most cases where there is a no-treatment comparison group included in the study, it is not an entirely accurate label because in early childhood center-based settings, all children participate in other activities. The impact of any particular intervention is dependent on the comparison condition. In ECE, there are a number of different and appropriate comparisons that could be made to isolate the effects of any particular intervention. The ECE review includes in its overall

[1] A main task for the WWC is to answer the question of intervention effectiveness. To this end, the WWC may use the data provided in studies differently than intended by the study author.

rating of effectiveness for any intervention the comparison that enables the best isolation of the effects of the intervention. In some cases, this means that the additive effects of a particular component of an intervention (e.g., adult interaction with shared book reading) will be examined in relation to the intervention in absence of that additive component (e.g., shared book reading).

SPECIFIC TOPIC PARAMETERS

The following parameters specify which studies are considered for analyses and which aspects of those studies are coded for the review.

1. **The characteristics necessary to define interventions that reflect commonly shared and/or theoretically derived characteristics.**

   Theoretical and Philosophical Basis

   - Primary goal is to enhance cognitive and language competencies associated with the school readiness of preschool children.

   Implementation

   - Implemented in a center-based setting (child-care center, school-based preschool, Head Start, or other center-based preschool setting). The program may include other components (e.g., parent training, education) but only those interventions that are implemented primarily in the center-based setting and evaluated as a distinct program component are included in the review.

   - The intervention must be implemented in 1985 or after.[2] This time frame was established because we needed to set parameters defining a realistic scope of work for the ECE review. Identification of rigorous evaluations of interventions implemented in the last 20 years is the highest priority because they test versions of interventions that are most likely to be available to practitioners today and were tested under conditions more likely to be similar to those existing today.

[2] If sufficient time and resources remain after we have completed our review of research on interventions implemented post 1985, the ECE team will consider reviewing older research on curricula that are still in widespread use. Widespread use will be established using evidence from surveys such as the Head Start Family and Child Experiences Survey (see for example, http://www.acf.hhs.gov/programs/opre/hs/faces/reports/faces00_4thprogress/faces00_title.html) and other available information on current curriculum sales and use.

2. **Interventions must be able to be disseminated. For an intervention to meet this criterion, it must be branded, or the following characteristics of an intervention must be documented in the study so that the intervention can be reproduced with fidelity with different participants, in other settings, at other times:**

    - The target population
    - Characteristics of the center-based settings in which the intervention is implemented, including the qualifications and training of the center staff implementing the intervention
    - Characteristics of the intervention, including activities to change or maintain the center environment that are part of the intervention, the appropriate use of support materials and prescribed classroom structures, and specific pedagogical strategies or activities
    - Duration and intensity of the intervention

    Branded interventions are particularly conducive to being reproduced with fidelity. A branded intervention is characterized by any of the following criteria:

    - Has an external developer that provides technical assistance or sells/distributes the intervention
    - Is packaged or otherwise available for distribution/use beyond a single site with sufficient documentation to allow the program or practice to be implemented by individuals other than the developers (e.g., has a manual, curriculum guide, or other sufficiently detailed instructions for implementation)
    - Is trademarked or copyrighted

3. **Primary classes of outcomes include cognitive development, language competencies, literacy, and math competencies, and secondary classes of outcomes include socio-emotional development and approaches to learning.**

    To be included in the review, a study must include at least one cognitive, language, literacy, or math outcome that is intentionally targeted by the intervention and measured via direct assessment. A study may also include other outcomes related to school readiness, such as socio-emotional outcomes or approaches to learning.

4. **Evidence sufficient for an outcome measure to demonstrate each type of reliability. (Screener Characteristic: to pass the screening for full coding, a study must include at least one relevant measure that demonstrates marginally acceptable or acceptable reliability according to the criteria below OR that shows evidence of face validity.)**

    As part of the coding process, the reliability of each outcome measure will be determined to be acceptable, marginally acceptable, or unacceptable according to the reliability measures and thresholds described below:

Type of Reliability	Minimum to be considered acceptable	Minimum to be considered marginally acceptable
Internal consistency	.70	.60
Temporal stability/test-retest reliability*	.60	.40
Inter-rater reliability		
% agreement	.80	.50
Correlation	.70	.50
Kappa	.70	.50

*Standards for temporal stability are difficult to set without knowing the construct (and its theoretical stability) and the test interval. Coders will be asked to record the test interval along with the test-retest reliability and the PIs will review the appropriateness of the above criteria in instances where test-retest reliability falls below these thresholds.

If a study includes only measures that are marginally acceptable (no measures that are acceptable according to the above thresholds), then that will be indicated in the intervention report's discussion of the evidence base.

5. The interval of time in which studies should have been conducted to be appropriate for the Evidence Report.

Studies need to have been conducted within the past 20 years (i.e., with a publication date of 1985 or later). This is the default time interval for all WWC reviews. This timeframe adequately represents the current status of the field as well as allows for a manageable project scope.

6. The necessary characteristics that define the target population.

- Children must be between the ages of three and five years and not yet enrolled in kindergarten or the children must be in preschool.
- In cases where the authors provide aggregated data for both preschool and kindergarten children and disaggregated data are unavailable, the ECE team will review the study as long as the majority of the children are in preschool (i.e., 60% or more)[3]
- Children reside and attend a preschool or child-care center within the United States (including U.S. Territories and Tribal Entities) or in a sufficiently similar country that the study can reasonably be considered replicable in the U.S. (e.g., English is the societal language).

[3] There are at least two reasons for this parameter: (a) there is little evidence that there is a clear demarcation of predictive relations or impact in the transition from preschool to kindergarten; and, (b) it is unlikely that the ECE team would include an intervention on which another WWC team is reporting.

7. The important characteristics of participants that might be related to the intervention's effect that must be equated if a study does not employ random assignment or RDD.

In QED comparison studies, groups of children being compared must be drawn from the same population of children. Consequently, groups must be roughly equivalent with regard to the pretest of the outcome measure or its proxy (e.g., groups differ on the pretest by less than 1/2 a standard deviation or the difference is not significant in an adequately powered test). The ECE Evidence Report Team will also assess whether the groups are equivalent along the following dimensions:

- Age
- Gender
- Race/ethnicity
- Setting
- Prevalence of developmental delays and disabilities
- Family and community demographics (e.g., socioeconomic status, education, etc.)

Evidence that the groups in a QED comparison group study differ substantially on these dimensions can result in the failure of a study because substantial differences suggest that the groups represent distinct populations. Evidence of a 25% or greater difference between groups in gender, race/ethnicity, prevalence of developmental delay/disability, or SES as a status variable (i.e., children defined as from low versus middle SES families), or evidence that the groups come from distinctly different settings (e.g., Head Start versus fee-for-service preschool), or reported mean age differences between groups of more than 1/2 the sample standard deviation suggests that the groups represent different populations. Not all studies will report on all of these factors, however. A study that does not report all of these factors will not be failed. However, the onus for demonstrating initial equivalence of groups rests with the investigator. Sufficient reporting of these factors should be included (or obtained) to establish the initial equivalence of the groups.

8. The characteristics of participants that are important to document and to examine intervention effects for include:

- Age (3 to 4 and 4 to 5)
- Gender
- Socioeconomic status
- Race/ethnicity
- English language learner

- Presence of a delay or disability

9. The characteristics of settings that are important to document and to examine intervention effects for include:

- Location (urban, suburban, or rural)
- Center type (child care center, school-based prekindergarten, Head Start, other)
- Staff education, qualifications (e.g., certification, years of experience), and training

10. The appropriate interval for measuring the intervention's (i.e., curriculum's) effect relative to the end of the intervention.

The benefits of an early childhood education intervention are intended to be retained well past the end of the intervention. Thus, measures at the end of an intervention, as well as any time thereafter, are admissible. Measures occurring several months or years after the intervention may provide strong evidence for an intervention's effectiveness. The ECE team, however, prioritizes immediate posttest findings for developing intervention ratings and improvement indices because these findings are most prevalent in ECE studies, but the ECE team includes follow-up findings, when available and appropriate, in appendices to the report.

11. The WWC has established that severe overall attrition be defined as follows:

In individual RCTs and well-controlled QEDs, severe overall attrition is defined as greater than 20% loss. If overall attrition is less than or equal to 20%, we assume that the bias associated with it is minimal. If it is greater than 20%, the burden of proof shifts, and the study authors need to show that overall attrition did not bias the effect size estimate. A post-attrition demonstration of group equivalence on the pretest is required. "Post-attrition demonstration of group equivalence" is defined as either a well-powered (.80) test of equivalence that is nonsignificant or a standardized mean difference between groups of less than d = .10. In some early childhood populations, high levels of attrition are normative. Consequently, attrition higher than 20% will not invalidate a study. However, demonstration of post-attrition equivalence of groups on pretests will be assessed.

In cluster RCTs, attrition needs to be considered at two levels: the cluster and the individual child. Because attrition at the individual level may not change the cluster-level characteristics (except aggregated individual characteristics), the bar for severe overall attrition at the child level can be less stringent than it is for studies in which individual children are randomly assigned and where attrition introduces selection bias into the design. The ECE review team considers a combination of percent sampled and percent responding to determine if there is severe within-cluster overall attrition. If the remaining sample represents at least 60% of the initial cluster membership, attrition is not assumed to be severe (e.g., if a researcher samples 100% of the initial cluster, up to 40% attrition is acceptable at the within-cluster level).

12. The WWC has established that differential attrition from the intervention and control groups be defined as follows:

In individual RCTs, cluster RCTs, and well-controlled QEDs, differential attrition from the intervention and control groups is defined as being greater than 7% differential loss. If differential attrition is less than or equal to 7%, we assume that the bias associated with it is minimal. If it is greater than 7%, the burden of proof shifts, and the study authors need to show that differential attrition did not bias the effect size estimate. A post-attrition demonstration of group equivalence on the pretest is required. "Post-attrition demonstration of group equivalence" is defined as either a well-powered (.80) test of equivalence that is nonsignificant or a standardized mean difference between groups of less than d = .10.

13. The statistical properties of the data that are important to obtain an accurate estimate of an effect size.

- For most statistics (including d-indexes), normal distribution and homogeneous variances are important properties.
- For odds-ratios there are no required desirable properties except the minimum of 5 observations per cell.
- In the case where a misaligned analysis is reported (i.e., unit of analysis is not the same as the unit of assignment) and the author is not able to provide a corrected analysis, the effect sizes computed by the WWC will incorporate a statistical adjustment for clustering. The default intraclass correlation used for early childhood education achievement outcomes is 0.20. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch.

  In the case where multiple comparisons are made (i.e., multiple outcome measures are assessed within an outcome domain in one study), the WWC accounts for this multiplicity by adjusting the author reported statistical significance of the effect using the Benjamini-Hochberg correction. See Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate statistical significance.

METHODOLOGY

Literature Search Strategies

The WWC Evidence Report Team employs comprehensive and systematic literature search strategies to identify the population of published and unpublished relevant studies. This section contains topic specific elements of the literature search (e.g., search terms, additional journals, and associations).

Key Word List

The key word list for ECE must be sufficiently comprehensive to capture the breadth of the topic. Unlike other WWC topics, ECE has a breadth of outcomes (i.e., language, literacy, cognition, and math) and interventions, many of which have synonyms that must be used in the searches to adequately capture all potentially relevant literature. The best way to capture the breadth of the topic is to include a comprehensive set of search terms.

1. **Language.** The purpose of this set of key words is to identify ALL articles dealing with language, language abilities, language development, and language learning. These are all synonyms and related terms. They should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

   Child language
   Dialect
   Distinctive features (Language)
   Expressive language
   Grammar
   Intonation
   Language
   Language acquisition
   Language development
   Language fluency
   Language impairments
   Language learning
   Language processing
   Language skills
   Language typology
   Lexical development
   Lexicology
   Listening comprehension
   Metalinguistics
   Morphology
   Oral Language
   Phonemic
   Phonemic awareness
   Phonetic
   Phonological awareness
   Phonological processing
   Phonological sensitivity
   Phonology
   Pragmatics
   Psycholinguistics
   Receptive language
   Semantics
   Semiotics
   Speech
   Speech communication
   Speech skills
   Syntax
   Verbal communication
   Verbal development
   Vocabulary

2. **Cognition.** The purpose of this set is to identify ALL articles dealing with cognitive abilities (excluding language issues) including learning, perception, memory, and intellect. These are all synonyms and related terms. They should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

   Aptitude
   Attention
   Attention control
   Attention span
   Auditory perception
   Automatic processing
   Automaticity
   Cognition
   Cognitive ability
   Cognitive behavior
   Cognitive development
   Cognitive flexibility
   Cognitive functioning
   Cognitive load
   Cognitive models
   Cognitive processes
   Cognitive psychology
   Cognitive research
   Cognitive skills
   Cognitive strategies
   Cognitive structures
   Cognitive style
   Concept development
   Concept formation
   Conceptual change
   Conceptual tempo
   Encoding
   Information processing

Intelligence
IQ
Learning processes
Long-term memory
Memorization
Memory
Metacognition
Perception
Rapid naming
Recall
Recognition
Retention
Schema
Schema theory
Schemata
Short-term memory
Social cognition
Visual perception

3. **Preschool.** The purpose of this is to identify any influences upon early literacy by any kind of schooling or care arrangement or instructional approach or program. These are all synonyms and related terms. They should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Childcare
Child care
Child caregivers
Day care centers
Day care effects
Early childhood education
Early experience
Early identification
Early intervention
Even Start
Head Start
Individualized reading
Initial teaching alphabet
Language experience approach
Prekindergarten
Prekindergarten classes
Prekindergarten teachers
Preschool
Preschool clinics
Preschool curriculum
Preschool experience
Preschool programs
Preschool teachers
Reciprocal teaching
Special education
Sustained silent reading

4. **Word learning.** The purpose of this set is to identify all information about the learning of words and word parts in reading and writing. Anything dealing with decoding the printed word or encoding (spelling) is included here. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Alphabet
Alphabets
Basic vocabulary
Consonants
Context clues
Decoding
Grapheme
Invented spelling
Letters (alphabet)
Letter identification
Letter knowledge
Morphemes
Morphophonemic
Orthographic symbols
Pattern recognition
Phoneme grapheme correspondence
Phonemes
Phonemic awareness
Phonics
Phonology
Rhyming
Sight method
Sight vocabulary
Spelling
Structural analysis
Syllables
Vowels
Word lists
Word recognition
Word study skills

5. **Fluency.** The purpose of this set of key words is to identify all information about the learning of fluency (speed, accuracy, expression) in reading. Anything dealing with fluency in oral and silent reading is included here. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Context clues
Eye voice span
Fluency
Intonation
Miscue analysis
Oral interpretation
Oral reading
Prosody
Reading aloud to others
Reading rate
Silent reading

6. **Reading Comprehension.** The purpose of this set of key words is to identify all information about the learning of fluency (speed, accuracy, expression) in reading. Anything dealing with fluency in oral and silent reading is included here. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Comprehension
Content area reading
Critical reading
Reader response
Reader text relation
Schema theory
Story grammar
Text structure

7. **Literacy.** This set of key words is designed to identify any articles that deal with reading and writing. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Language arts
Literacy
Beginning reading
Content area reading
Corrective reading
Critical reading
Early reading
Functional reading
Independent reading
Oral reading
Recreational reading
Remedial reading
Silent reading
Story reading
Reading ability
Reading achievement
Reading comprehension
Decoding
Reading diagnosis
Reading difficulties
Reading failure
Reading improvement
Reading instruction
Reading motivation
Reading processes
Reading programs
Reading readiness
Reading research
Reading skills
Reading strategies
Reading writing relationship
Writing (composition)
Writing ability
Writing achievement
Writing attitudes
Writing contexts
Writing development
Writing difficulties
Writing evaluation
Writing improvement
Writing instruction
Writing motivation
Writing processes
Writing readiness
Writing research
Writing skills
Writing strategies

8. **Miscellaneous Literacy.** The purpose of this set of key words is to identify all information about reading and writing that is not included in the other sets (including writing and concepts of print). The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Concept of word
Concepts about print
Concepts of print
Conventions of print
Developmental delays
Directionality
Early literacy
Early writing
Emergent literacy
Emergent writing skills
Environmental print
Name writing
Prevention
Print awareness
Reading habits
Reading process
Reading readiness
Reading strategies
School readiness
Special needs students
Story reading
Writing (composition)
Writing ability
Writing achievement
Writing attitudes
Writing contexts
Writing development
Writing difficulties
Writing evaluation
Writing improvement
Writing instruction
Writing motivation
Writing processes
Writing readiness
Writing research
Writing skills
Writing strategies

9. Math. This set of key words is designed to identify any articles that deal with math. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Algebra
Arithmetic
Connections
Correspondence
Counting
Fractions
Geometry
Grouping
Mathematical aptitude
Mathematical skills
Mathematical concepts
Mathematics
Mathematics achievement
Mathematics instruction
Mathematics outcome
Mathematic* ability
Measurement
Number
Numbers
Numeracy
Numerals
Operations
Patterning
Patterns
Problem solving
Proof
Properties
Properties mathematics
Reasoning
Remedial math
Representation
Seriation
Shape
Sorting
Spatial ability
Supplemental math

10. Age group. This set of key words is designed to identify children by age. We want to find anything written on children from ages 3 to 5, excluding kindergarten. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Early childhood
Early experience
Pre-kindergarten children
Preschool children
Young children

11. Intervention/evaluation. This set of key words is designed to identify any articles that deal with evaluation studies, including randomized and quasi-experimental designs. The key words should be linked together with OR in a search—meaning that we will identify a set of all articles that focuses on any one of the following topics.

Between group designs
Control group
Comparison group
Curriculum
Early intervention
Education experiments
Educational improvement
Educational program evaluation
Evaluation
Experimental design
Experimental groups
Experimental replication
Experimental subjects
Experimentation
Group design
Impact analysis
Impact evaluation
Instruction
Intervention
Matched groups
Posttesting
Posttests
Pretesting
Pretests
Program effectiveness
Program evaluation
Program impacts
Quasi-experimental design
Repeated measures
Regression discontinuity design
Treatment effectiveness evaluation
Treatment group

A combination of Boolean terms such as AND and OR will be used with this keyword list. The content lists (1 through 11) will be linked with OR, and that will be linked with the target population and intervention lists with AND. The librarian at AIR will be consulted and the searches will be tailored according to each specific electronic database.

Proper Nouns (Specific programs)

Comprehensive Curricula

A Beka
Bank Street Developmental Interaction Approach
Beyond Centers and Circle Time
Bright Beginnings
Core Knowledge Preschool Sequence
Core Knowledge Foundation
Creative Curriculum
Curiosity Corner (CC)
DLM Early Childhood Express
Doors to Discovery
FunShine Express: Fireflies/Sprouts
Funsteps, Inc.
Growing Readers Early Literacy Curriculum (High Scope)
High Reach
High/Scope Curriculum
Innovations Comprehensive Preschool Curriculum (Gryphon House Pub.)
Language for Learning
Let's Begin with the Letter People Pre-K Core Program
Literacy Express
Marazon system
Montessori Method
Opening the World of Learning
Pebble Soup
Primrose Schools
Read, Play, and Learn!
Ready, Set, Leap!
Reggio Emilia
Saxon Early Learning
Scholastic Early Childhood Program curriculum
School Readiness Express
S.P.A.R.K.
We Can! Curriculum
Wee Learn

Supplemental Curricula

Active Early Learning Kit for Pre-K by Steck-Vaughn
Active Learning
Big Math for Little Kids
Breakthrough to Literacy
Building Early Literacy and Language Skills (BELLS)
Building Language for Literacy (BLL-Scholastic)
Compass Learning Odyssey Pre-K/K
Creative Curriculum (Literacy: The Creative Curriculum Approach)
Early Learning and Literacy Model (ELLM)
Fast ForWord Preschool
Headsprout Reading Basics
High/Scope Preschool Key Experiences Series, Booklets and Videos (Set of 6)
Houghton Mifflin PreK
Journeys into Early Literacy (precursor to Destination Reading)
Kaplan Planning Guide to the Preschool Curriculum
Ladders to Literacy: A Preschool Activity Book
LeapDesk Workstation
Learningames – Abecedarian
Links to Literacy Curriculum Kit
Open Court Reading (OCR) Pre-K
Phonemic Awareness in Young Children: A Classroom Curriculum
ReadingLine Kits
Rightstart/Numberworlds
ScienceStart!
Sounds Abound
Stepping Stones to Literacy
Waterford Early Reading Program Pre-K (WERP)

General Practices

Dialogic Reading/Interactive Shared Picture-Book Reading
Letter Knowledge Training
Phonological Awareness Training

Targeted (OSEP) Practices

Classwide peer tutoring
Conversation-based language intervention
Conversational-recasting
Explicit attention to articulation
Functional communication training
Graphics-based software tools
Imitation-based language intervention
Peer-mediated intervention
Peer training
Pragmatic teaching
Redirects
Self-initiated augmentative communication treatment
Stimulus control procedure
Syntax program
Teaching phonological awareness
Teaching rhyming
Teaching-script
Teaching story grammar knowledge
Text-based software tools
Time delay
Verbal labeling responses
Video discourse intervention
Written text cueing

List of Journals to be Handsearched

1. Child Development
2. Developmental Psychology
3. Early Childhood Research Quarterly
4. Early Education and Development
5. Journal of Early Intervention
6. Journal of Educational Psychology
7. Journal of Experimental Child Psychology
8. Reading Research Quarterly
9. Topics in Early Childhood Special Education

Supplementary List of Organizations

1. National Association for the Education of Young Children (www.naeyc.org)
2. National Child Care Information Center (www.nccic.org)
3. National Early Childhood Technical Assistance Center (NECTAC) (www.nectac.org)
4. National Institute for Early Education Research (www.nieer.org)
5. Promising Practices Network operated by the Rand Corporation (www.promisingpractices.net)
6. Society for Research in Child Development (www.srcd.org)

Personal Contacts

The WWC ECE Evidence Report Team solicits studies directly from experts who work on early childhood education interventions. The Principal Investigators (PIs) identify these experts. We also contact experts using listservs dedicated to this topic and whose members are scholars working in this area.

Developers of programs identified as relevant to the topic are another source of contacts. The WWC Early Childhood Education Evidence Report Team solicits studies and any additional information about the program from the developers.

After the identification of studies to be reviewed, we contact the authors of these studies to request similar materials and to ask them to "snowball" the process to colleagues whom they recommend for their work in this area.